

PCTWORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

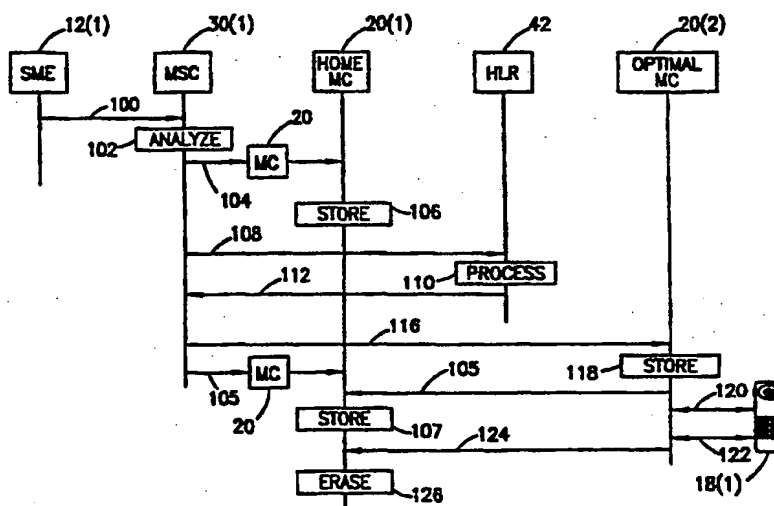
AE

DS

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04Q 7/22		A1	(11) International Publication Number: WO 99/27724														
			(43) International Publication Date: 3 June 1999 (03.06.99)														
(21) International Application Number: PCT/SE98/02132			(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).														
(22) International Filing Date: 24 November 1998 (24.11.98)																	
(30) Priority Data: 08/979,246 26 November 1997 (26.11.97) US																	
(71) Applicant: TELEFONAKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE).																	
(72) Inventors: PATEL, Sonal; Apartment 43, 4500 De Maison-neuve West, Westmount, Quebec H3Z 1L7 (CA). KATINAKIS, Nikos; 3620 Ridgewood #604, Montreal, Quebec H3G 1B5 (CA). JOONG, Donald; 9147 25th Avenue, Montreal, Quebec H1Z 4C7 (CA). RAHMAN, Akbar; Apartment #106, 2600 Draper Avenue, Ottawa, Ontario K2H 9A9 (CA).																	
(74) Agent: ERICSSON RADIO SYSTEMS AB; Common Patent Dept., S-164 80 Stockholm (SE).																	
Published With international search report.																	
<table border="1"><tr><td>Vorlage</td><td>Ablage</td><td rowspan="2">D2789</td></tr><tr><td colspan="2">Haupttermin</td></tr><tr><td colspan="3">Eing.: 07. OKT. 2004</td></tr><tr><td colspan="3">PA. Dr. Peter Riebling</td></tr><tr><td>Seab.</td><td colspan="2">Vorgelegt.</td></tr></table>				Vorlage	Ablage	D2789	Haupttermin		Eing.: 07. OKT. 2004			PA. Dr. Peter Riebling			Seab.	Vorgelegt.	
Vorlage	Ablage	D2789															
Haupttermin																	
Eing.: 07. OKT. 2004																	
PA. Dr. Peter Riebling																	
Seab.	Vorgelegt.																

(54) Title: DISTRIBUTED DATA STORAGE AND DELIVERY IN A CELLULAR TELEPHONE NETWORK



(57) Abstract

Procedures are disclosed for supporting roaming subscriber mobile station (18) access to stored subscriber data messages. In one aspect, a received subscriber data message is routed for storage and subsequent forwarding/retrieval, not to a "home" message center (20(1)), but instead to a message center (20(2)) either optimally positioned with respect to a current known location of the subscriber mobile station or associated with an initially receiving mobile switching center (30(1)). In another aspect, a mailbox (46) established for a given subscriber mobile station in the home message center is transferred (210), perhaps on a periodic basis, for storage in a local mailbox of a proximate message center within a cellular telephone network (10v) where the subscriber is currently roaming. In either case, the storing message center thereafter performs any requisite operations needed to facilitate message forwarding to or retrieval by the addressee subscriber mobile station.

DISTRIBUTED DATA STORAGE AND DELIVERY IN A CELLULAR TELEPHONE NETWORK

BACKGROUND OF THE INVENTION

5 Technical Field of the Invention

The present invention relates to cellular telephone networks and, in particular, to the distributed storage and delivery of data associated with cellular telephone network supported subscriber data services (such as short message, facsimile, voice mail and electronic mail delivery).

10 Description of Related Art

Reference is now made to FIGURE 1 wherein there is shown a block diagram of a conventional digital cellular telephone network 10. The network 10 supports one or more subscriber data services (such as short message, facsimile, voice mail and electronic mail delivery) for use by subscribers in conjunction with their conventional
15 cellular telephone service. The purpose of the subscriber data services is to provide a means for transferring subscriber data messages between message entities (MEs) 12 using the communications environment provided by the cellular telephone network 10.

The message entities 12 participating in the subscriber data service comprise data terminals (DTs) 14 connected to the fixed telephone network 16 (comprising a
20 public switched telephone network (PSTN) or other equivalent/similar telephone network). The message entities 12 further comprise the subscriber mobile stations (MS) 18 operating within the cellular telephone network 10. Subscriber data messages must originate with or terminate at one of the subscriber mobile stations 18.

Multiple message centers (MC) 20 are provided and connected to the fixed
25 telephone network 16 and to the cellular telephone network 10. Each message center 20 is a multi-media platform that functions as a store and forward/retrieve center for receiving and delivering subscriber data messages between the message entities 12. When a subscriber data message is originated, it is first sent to a message center 20 associated with that addressor subscriber. The message is then forwarded to another
30 message center 20 associated with the addressee subscriber. At that point, the message

- 3 -

and added user/service provider costs. This is especially a problem with subscriber data messages (such as facsimile, voice or the like) which require the establishment of a circuit connection to effectuate delivery.

Second, with respect to message center 20 store and retrieve operation, all
5 subscriber data messages are again initially stored in the home message center (of a home service area within the cellular telephone network 10h) for the addressee roaming/moving subscriber mobile station 18. This message center 20 then must then be queried by the roaming subscriber mobile station 18 from the visited service area within the cellular telephone network 10v to collect the stored messages. When
10 roaming, in particular, this querying operation to retrieve messages can be costly and inefficient. This is especially a problem with subscriber data messages (such as facsimile, voice or the like) which require the establishment of a circuit connection to effectuate delivery.

What is needed then is a more efficient network architecture and topology for
15 handling stored subscriber data message delivery (either forwarding or retrieval) to roaming/moving subscriber mobile stations.

SUMMARY OF THE INVENTION

In a first embodiment of the present invention, the prior art "home" message center network architecture and topology is abandoned in favor of a distributed
20 message center network architecture and topology. In this distributed architecture and topology, a received subscriber data message is routed for storage and subsequent forwarding, not to a "home" message center conventionally provided for an addressee subscriber mobile station, but instead to a message center optimally positioned with respect to the subscriber mobile station or associated with an initially receiving mobile
25 switching center. That optimally positioned message center is identified by querying the home location register for the addressee subscriber mobile station and processing current location information. Following receipt of the subscriber data message, the storing message center performs any requisite operations needed to facilitate message forwarding to the addressee subscriber mobile station.

30 In a second embodiment of the present invention, a mailbox established for a given subscriber mobile station in the home message center is given an optional

DETAILED DESCRIPTION OF THE DRAWINGS

1. Distributed Architecture and Topology

Reference is now made, in combination with FIGURE 1, to FIGURE 2 wherein there is shown a message flow and nodal operation diagram illustrating the handling of subscriber data messages in a message center distributed network architecture and topology. A subscriber data message 100 is generated by an addressor message entity 12(1) and received by a (gateway or originating) mobile switching center 30(1) of the cellular telephone network. The mobile switching center 30(1) analyzes the addressee information for the subscriber data message 100 in action 102, and using an appropriate address look-up mechanism/process, identifies a "home" message center 20(1) associated with an addressee subscriber mobile station 18(1) that is the destination of the subscriber data message.

In accordance with known prior art message handling procedures, the received subscriber data message 100 is forwarded 104 to the identified "home" message center 20(1) for the addressee subscriber mobile station 18(1) through a message center 20 associated with the short message entity 12(1) and stored (action 106). By "home" it is meant that message center 20(1) assigned to and maintained by a service provider to which the addressee subscriber mobile station 18(1) has subscribed for telephone service. Storage 106 in the home message center 20(1) provides a back-up copy of the message 100 in the event it is later needed. This procedure for backing-up the subscriber data message 100 in the home message center 20(1) is, however, optional in accordance with the present invention.

Contrary to conventional practice, no attempt is made by the home message center 20(1) in the present invention to deliver (for example, forward) the stored message to the addressee subscriber mobile station 18(1). The reason for this is that the home message center 20(1) recognizes, either from an indication supplied by the mobile switching center 30(1) in the message forward 104, or by querying the home location register 42 (not shown), that another, optimally positioned, message center has also been sent the message for attempted delivery.

In accordance with a distributed architecture and topology implemented in connection with the present invention, the mobile switching center 30(1) further queries 108 the identified home location register 42 for the current location of the

- 7 -

If the delivery 120 or 122 is successful, a message 124 indicative of such is sent to the home message center 20(1) so that the previously stored 106 message, or previously stored 107 message data, may be erased (action 126). This message 124 may further provide the home message center 20(1) with charging information relating to the store and forward/retrieve operation effectuated for message delivery.

Reference is now made, in combination with FIGURE 1, to FIGURE 3 wherein there is shown a message flow and nodal operation diagram illustrating an alternative embodiment handling of subscriber data messages in a message center distributed network architecture and topology. A subscriber data message 100 is generated by an addressor message entity 12(1) and received by a receiving mobile switching center 30(1) of the cellular telephone network. The mobile switching center 30(1) analyzes the addressee information for the subscriber data message 100 in action 102, and using an appropriate look-up mechanism/process, identifies a home location register 42 associated with an addressee subscriber mobile station 18(1) that is the destination of the subscriber data message.

In accordance with known prior art message handling procedures, the received subscriber data message 100 is forwarded 104 to the identified "home" message center 20(1) for the addressee subscriber mobile station 18(1) through a message center 20 associated with the short message entity 12(1) and stored (action 106). By "home" it is meant that message center 20(1) assigned to and maintained by a service provider to which the addressee subscriber mobile station 18(1) has subscribed for telephone service. Storage 106 in the home message center 20(1) provides a back-up copy of the message 100 in the event it is later needed. This procedure for backing-up the subscriber data message 100 in the home message center 20(1) is, however, optional.

Contrary to conventional practice, no attempt is made by the home message center 20(1) in the present invention to deliver (for example, forward) the stored message to the addressee subscriber mobile station 18(1). The reason for this is that the home message center 20(1) recognizes, either from an indication supplied by the mobile switching center 30(1) in the message forward 104, or by querying the home location register 42 (not shown), that another, optimally positioned, message center has also been sent the message for attempted delivery.

- 9 -

may further provide the home message center 20(1) with charging information relating to the store and forward/retrieve operation effectuated for message delivery.

Reference is now made, in combination with FIGURE 1, to FIGURE 4 wherein there is shown a message flow and nodal operation diagram illustrating yet another alternative embodiment handling of subscriber data messages in a message center distributed network architecture and topology. A subscriber data message 100 is generated by an addressor message entity 12(1) and received by a receiving mobile switching center 30(1) of the cellular telephone network. The receiving mobile switching center 30(1) analyzes the addressee information for the subscriber data message 100 in action 102, and using an appropriate look-up mechanism/process, identifies a home location register 42 associated with an addressee subscriber mobile station 18(1) that is the destination of the subscriber data message, and further identifies a message center 20(1) that is associated with the receiving mobile switching center.

The received subscriber data message 100 is then forwarded 128 to the identified message center 20(1) associated with the receiving mobile switching center 30(1) and stored (action 130). Storage 106 in the home message center 20(1) provides a back-up copy of the message 100 in the event it is later needed. This procedure for backing-up the subscriber data message 100 in the home message center 20(1) is, however, optional.

No attempt is made by the associated message center 20(1) to deliver (through either forward or retrieve) the stored message to the addressee subscriber mobile station 18(1). The reason for this is that the associated message center 20(1) recognizes, either from an indication supplied by the receiving mobile switching center 30(1) in the message forward 104, or by querying the home location register 42 (not shown), that another, optimally positioned, message center has also been sent the message for attempted delivery.

In accordance with a distributed architecture and topology implemented in connection with the present invention, the mobile switching center 30(1) further queries 108 the identified home location register 42 for the current location of the addressee subscriber mobile station 18(1). The home location register 42 processes the query 108 in action 110 to identify the current location and identify an optimally

- 11 -

may further provide the associated message center 20(1) with charging information relating to the store and forward/retrieve operation effectuated for message delivery.

With respect to FIGURES 2, 3 and 4, different types of network transport connections may be utilized in order to implement the various recited message forwarding (104, 105, 116 or 128) or delivery (120 or 122) actions. For example, if the subscriber data message comprises a short message service (SMS) data message, excess capacity in the Signaling System No. 7 (SS7) network (not shown explicitly in FIGURE 1) is used for message transport within the network, and a control signaling channel is used on the air interface for communication with the addressee mobile station 18(1). Similar transport could be effectuated for electronic mail type data messages. If the subscriber data message instead comprises a facsimile data message, a circuit switched connection (not shown explicitly in FIGURE 1) is used for message transport within the network, and a traffic channel is used on the air interface for communication with the addressee mobile station 18(1). Similar transport could be effectuated for voice mail type data messages. The network service provider and/or subscriber may specify whether the charges for use of the network transport resources are to be billed to the addressor message entity 12(1) or the addressee subscriber mobile station 18(1).

2. Mailbox Portability

Reference is now once again made to FIGURE 1. Each message entity 12 is associated with both a "home" message center 20 of the home service area within the cellular telephone network 10h and a mailbox 46 maintained within that message center. It is in this mailbox 46 that subscriber data messages sent by or sent to the particular message entity 12 are stored. Mobile stations 18 are message entities 12 capable of movement. In most cases, movement of the mobile station, for example within its own home cellular telephone network 10h, does not present any particular difficulties with respect to the maintenance of the mailbox 46 and the sending or delivery of stored subscriber data messages.

Movement comprising roaming within a visited cellular telephone network 10v, on the other hand, does present some problems. While roaming within the visited cellular telephone network 10v, subscriber data messages for a given subscriber mobile station 18 continue to be saved in the home message center 20. In order to

- 13 -

mailbox portability within the cellular telephone network of FIGURE 1. When a roaming subscriber mobile station 18(2) initially registers 200 within a visited cellular telephone network 10v, the network, in conjunction with defining a service profile for and connecting a roamer directory number to the roaming mobile station (action 202), further defines and establishes (action 204) a local mailbox 46' for that subscriber in an associated message center 20(1). Following such initial definition and establishment, the associated message center 20(1) uses the network 50 to contact 206 a home message center 20(2) for that subscriber mobile station 18(2). Responsive to the contact 206, the home message center extracts any subscriber data messages stored in the mailbox 46 (action 208). These extracted messages are then transmitted 210 back over the network 50 to the associated message center 20(1), and stored (action 212) in the local mailbox 46'. A record 214 is kept by the home message center 20(2) of the current location of the mailbox 46' for the roaming subscriber mobile station 18(2). Any subsequently received mailbox 46 stored subscriber data messages may thereafter be periodically extracted 216 (for example, through polling) from the mailbox 46, transmitted 218 over the network to the associated message center 20(2), and stored 220 in the local mailbox 46'. Alternatively, the home location register 20 (see, FIGURE 1) stores information pointing to the current location of the mailbox 46' for the roaming subscriber mobile station 18(2). Any subsequently received subscriber data messages are then re-directed 218 over the network following home location register querying to the associated message center 20(2), and stored 220 in the local mailbox 46'. Once stored in the local mailbox 46', conventional forwarding 222 or retrieval 224 procedures well known to those skilled in the art (such as short message service (SMS) delivery, voice mail, large file delivery, and the like) are implemented to effectuate message delivery to the addressee roaming subscriber mobile station 18(2).

It will be understood that the transmission 210 or 218 of each stored subscriber data message over the network 50 may require the use of one or more different types of networks tailored for the specific type of message being sent. For example, one type of subscriber data message, such as a voice mail or facsimile message, may be sent over a circuit connection through an integrated service digital network (ISDN) or public switched telephone network (PSTN). Another type of subscriber data message,

- 15 -

WHAT IS CLAIMED IS:

1. A method for handling storage of subscriber data messages within a cellular telephone network, comprising the steps of:
 - receiving a subscriber data message transmitted to an addressee message entity;
 - 5 forwarding the received subscriber data message, not to a home message center associated with the addressee message entity, but instead to another message center;
 - storing the forwarded subscriber data message in the other message center; and
 - delivering the stored subscriber data message to the addressee message entity
 - 10 from the other message center.
2. The method as in claim 1 wherein the other message center comprises a message center assigned to a switching node of the cellular telephone network which initially received the subscriber data message transmitted to the addressee message entity.
- 15 3. The method as in claim 2 further including the step of sending a notification of subscriber data message forwarding to the home message center, the notification sent from the receiving switching node.
4. The method as in claim 2 further including the step of sending a notification of subscriber data message forwarding to the home message center, the
- 20 notification sent from the other message center.
5. The method as in claim 1 wherein the other message center comprises a message center proximate to a current location within the cellular telephone network of the addressee message entity.
6. The method as in claim 5 further comprising the steps of:
 - 25 querying a location database to determine an approximate location of the addressee message entity; and
 - processing the approximate location to identify the proximate message center.

- 17 -

14. The network as in claim 10 wherein the first message center comprises a home message center for the addressee message entity.

15. The network as in claim 10 wherein the switching node further operates to notify the first message center of the forwarding of the subscriber data message to the second message center.

16. The network as in claim 10 wherein the second message center operates to effectuate delivery of the forwarded subscriber data message to the addressee message entity.

17. The network as in claim 10 wherein the second message center operates to notify the first message center of the forwarding of the subscriber data message to the second message center.

18. A method for providing message center portability, comprising the steps of:

establishing a mailbox for a given message entity in a home message center;
responsive to a roamer registration of the given message entity establishing a local mailbox in a visited message center; and
transferring stored subscriber data message contents of the mailbox in the home message center for storage in the local mailbox of the visited message center.

19. The method as in claim 18 wherein the message entity comprises a subscriber mobile station operable within a cellular telephone network.

20. The method as in claim 18 wherein the step of transferring comprises the step of periodically transferring stored subscriber data message contents to the local mailbox.

FIG. 4

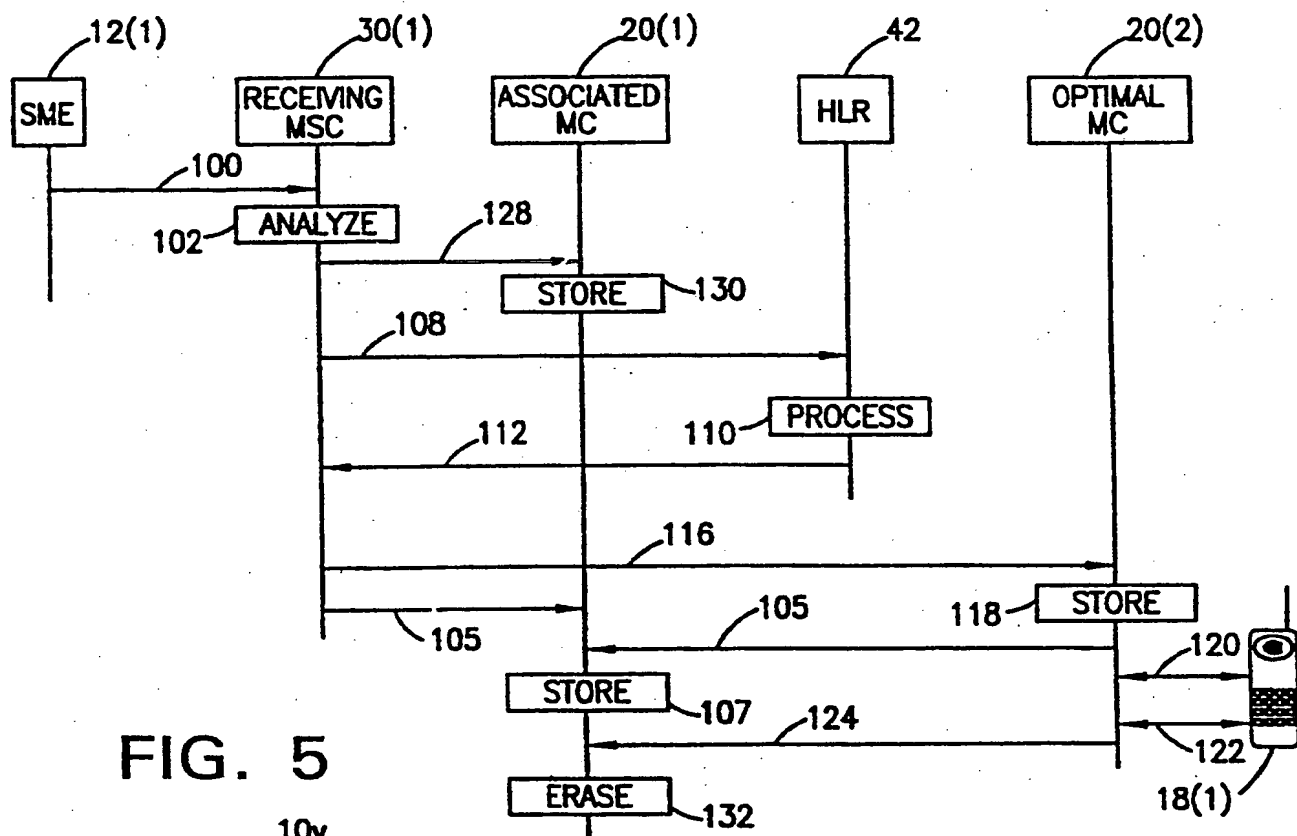
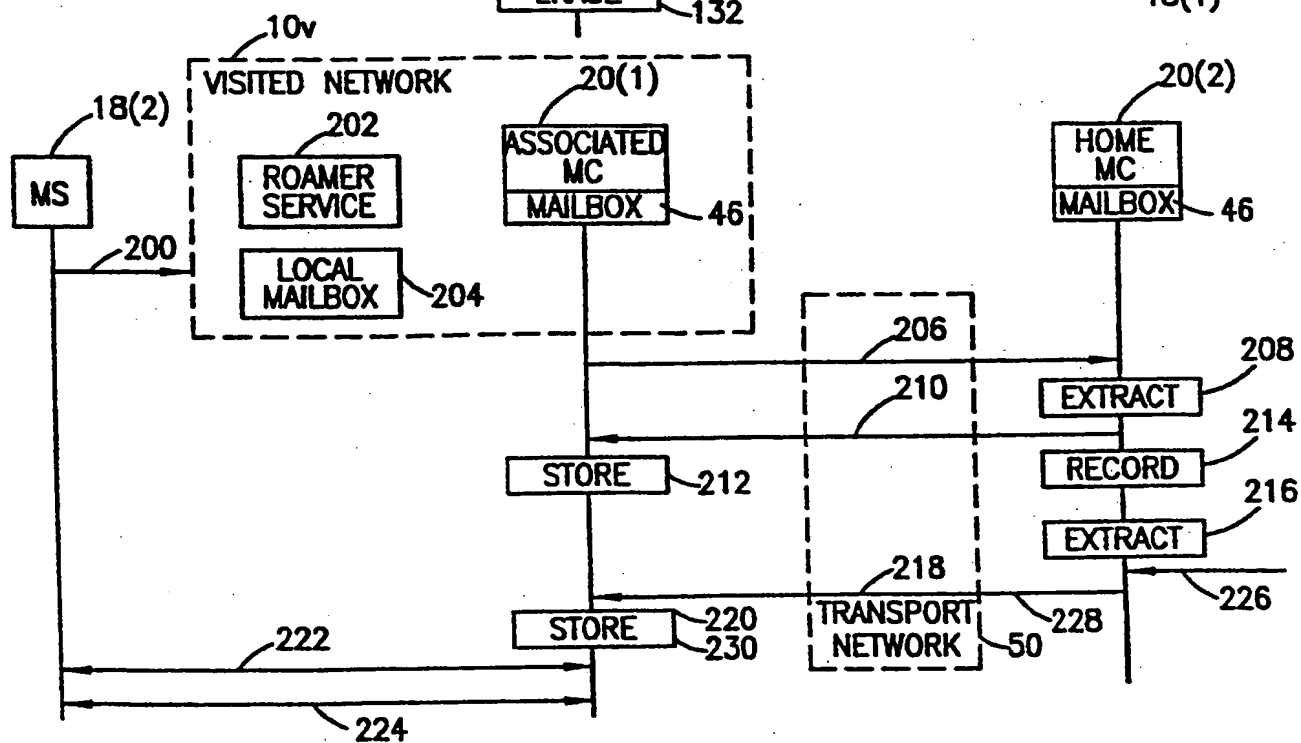


FIG. 5



INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/SE 98/02132

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0682457	A	15-11-1995	FI	942219 A	14-11-1995
			US	5627877 A	06-05-1997
EP 0820181	A	21-01-1998	US	5751792 A	12-05-1998
			CA	2207657 A	15-01-1998
			JP	10079794 A	24-03-1998
W0 9711564	A	27-03-1997	US	5666107 A	09-09-1997
			AU	6676696 A	09-04-1997
			CA	2232300 A	27-03-1997
			CN	1196810 A	21-10-1998
			EP	0852099 A	08-07-1998